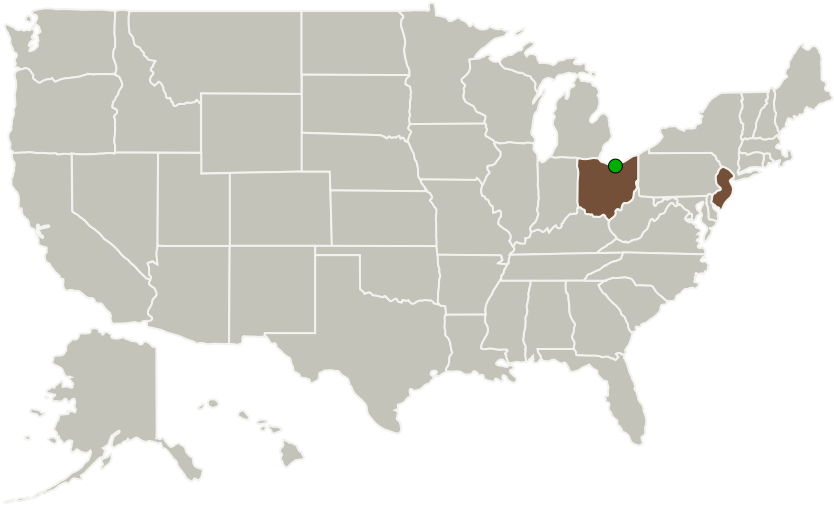
Design Environment for Multi-Fidelity and Multi-Disciplinary Components, Phase I

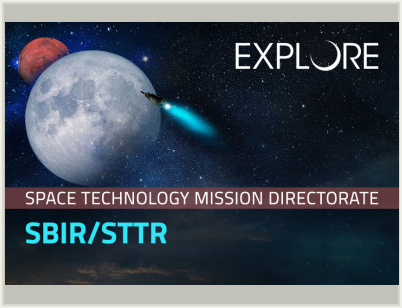
Completed Technology Project (2010 - 2010)

Project Introduction

Many of the most challenging categories of propulsion system development are related to the prediction of interacting effects between the fluid loads, thermal loads, and the structural deflection. In practice, the interactions between technical disciplines are often not fully explored analytically, and the analysis in one discipline often uses a simplified representation of other disciplines as an input or boundary condition. For example, the fluid forces in an engine generate static and dynamic rotor deflection, but the forces themselves are dependent on the rotor position and its orbit. A typical design practice might involve predicting the fluid and thermal loads for various conditions and passing those estimates along for inclusion with the structural model. This practice ignores the interaction between the physical phenomena where the outcome of each analysis can be heavily dependent on the inputs (i.e., changes in flow due to deflection, changes in deflection due to fluid forces). Such a rigid design process also lacks the flexibility to employ multiple levels of fidelity in the analysis of each of the components. In this project, Mechanical Solutions, Inc. (MSI) proposes to extend two existing software tools to develop a design environment with both breadth (to cover multiple disciplines) and depth (to cover multiple levels of fidelity).

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Mechanical Solutions, Inc.	Lead Organization	Industry	Whippany, New Jersey
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
New Jersey	Ohio

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139943)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Mechanical Solutions, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Eric Olson

Co-Investigator:

Eric C Olson

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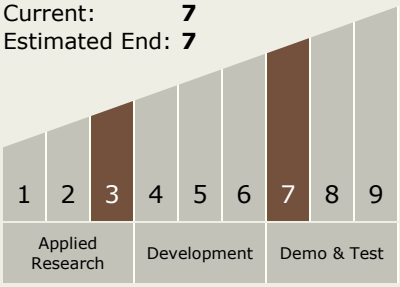
Technology Maturity (TRL)

Start: **3**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.5 Mission Architecture, Systems Analysis and Concept Development
    - TX11.5.3 Tools and Methodologies for Vehicle or Concept Definition Activities

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System